

Patent claims

1. A method for identifying a protein which has an elevated binding activity towards phosphorylated alpha-1,4-glucans, compared to non-phosphorylated alpha-1,4-glucans, wherein
 - a) protein extracts in preparations separate from one another are incubated with
 - i phosphorylated alpha-1,4-glucans and
 - ii non-phosphorylated alpha-1,4-glucans,
 - b) proteins specifically bound to the
 - i phosphorylated alpha-1,4-glucans from step a) i and
 - ii proteins specifically bound to the non-phosphorylated alpha-1,4-glucans from step a) iiare dissolved in preparations separate from one another and
 - c) proteins are identified which exhibit an elevated binding activity towards phosphorylated alpha-1,4-glucans used in step b) i, compared to non-phosphorylated alpha-1,4-glucans used in step b) ii.
2. A method for identifying a protein which exhibits alpha-1,4-glucan phosphorylating enzymatic activity and requires phosphorylated alpha-1,4-glucans as substrate, wherein
 - a) protein extracts are incubated with phosphorylated alpha-1,4-glucans,
 - b) proteins specifically bound to the phosphorylated alpha-1,4-glucans from step a) are dissolved,
 - c) proteins obtained according to step b) are respectively incubated with
 - i ATP and phosphorylated alpha-1,4-glucans and
 - ii ATP and non-phosphorylated alpha-1,4-glucansin preparations separated from one another,
 - d) the respective alpha-1,4-glucan obtained after incubation in step c) i or step c) ii is examined for introduction of further phosphate groups and
 - e) proteins are identified which in the incubation preparation according to c) i have introduced significant quantities of phosphate groups into alpha-1,4-

glucans and in the incubation preparation according to c) ii have introduced no significant quantities of phosphate groups into alpha-1,4-glucans.

3. The method according to claim 2, wherein the protein with alpha-1,4-glucan phosphorylating enzymatic activity uses phosphorylated starch as substrate.
4. The method according to claim 3, wherein the protein with alpha-1,4-glucan phosphorylating enzymatic activity originates from a plant.
5. A protein obtainable by a method according to one of claims 1 to 4.
6. A method for identifying a nucleic acid molecule coding for a protein which exhibits alpha-1,4-glucan phosphorylating enzymatic activity, wherein
 - a) a protein is identified by a method according one of claims 1 to 4,
 - b) amino acid sequences coding for the protein identified according to step a) are determined and
 - c) nucleic acid molecules are identified using the amino acids determined according to step b).
7. The method according to claim 6, wherein nucleic acid oligonucleotides based on the amino acid sequence determined according to step b) are manufactured to identify said nucleic acid molecule according to step c).
8. The method for identifying a nucleic acid molecule coding for a protein which exhibits alpha-1,4-glucan phosphorylating enzymatic activity, wherein
 - a) a protein is identified by a method according one of claims 1 to 4,
 - b) antibodies which react specifically with the protein identified according to step a) are produced and
 - c) nucleic acid molecules are identified using the antibodies produced according to step b).
9. A nucleic acid molecule obtainable by a method according to one of claims 6, 7 or 8.
10. A genetically modified plant cell, characterised in that it exhibits an elevated enzymatic activity of a protein according to claim 5 or a protein which can be

obtained by a method according to one of claims 1 to 4 compared to corresponding wild type plant cells which have not been genetically modified.

11. The genetically modified plant cell according to claim 10 which is a maize, rice, wheat, rye, oats, barley, cassava, potato, sweet potato, sago, mung bean, banana, pea, Arabidopsis, curcuma or sorghum plant.
12. A genetically modified plant characterised in that the genetic modification consists in the introduction of at least one foreign nucleic acid molecule according to claim 9 or which can be obtained by a method according to one of claims 6, 7 or 8 into the genome of the plant.
13. The genetically modified plant cell according to claim 12, which synthesises a modified starch compared to starch from corresponding wild type plant cells.
14. The genetically modified plant cell according to claim 13, which synthesises a modified starch which has an elevated content of starch phosphate and/or a modified phosphate distribution compared to starch from corresponding wild type plants.
15. The plant cell according to claim 14, wherein the modified starch is characterised in that it exhibits an elevated content of phosphate covalently bound to the starch in the C-3 position of the glucose molecule compared to starch from corresponding wild type plant cells.
16. A plant containing genetically modified plant cells according to one of claims 10 to 15.
17. The plant according to claim 16, which is a maize, rice, wheat, rye, oat, barley, cassava, potato, sago, mung bean, pea or sorghum plant.
18. The plant according to claim 17, which is a maize or wheat plant.